**2017 Cobra Invitational**

*Experimental Design – Division B*

**Team Name:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Team Number:** \_\_\_\_\_\_\_

Its summer and you are at the pool. As you chase your friend around the pool, you hear someone yell “Don’t run, the floor is wet and slippery”. You start thinking “Why does water make the floor slippery?” It’s due to FRICTION. **Friction** is a force that holds back the movement between two objects.

***Instructions:*** You have 50 minutes to design, conduct, cleanup, and document your findings on an experiment related to **friction**.

***Materials Available***

At your table:

Paper

Felt sheet

Wax paper

Sand paper

Toy car

Wooden block

Dice

Rubber bands

May use if brought:

Non-programmable calculator

Stopwatch

Ruler

Use blank sheets paper given to write up your experiment. If you need more, extra sheets are available at the front of the room. **Use this outline (points noted in parentheses):**

1. Statement of Problem: Experimental Question (4 Points)
2. Hypothesis: Including prior knowledge that contributed to hypothesis (8 Points)
3. Variables: i. Independent Variable: Factor being manipulated (6 Points)  
   ii. Dependent Variable: Factor being measured which responds (6 Points)  
   iii. Controlled Variables: Factors that are purposefully kept the same (8 Points)
4. Experimental Control (where applicable): (4 Points)
5. Materials (6 Points)
6. Procedure: Including Diagrams (12 Points)
7. Qualitative Observations During Experiment & Summary of Results: (8 Points)
8. Quantitative Data: including Data Table (12 Points)
9. Graphs: (10 Points)
10. Statistic: e.g., mean, median, mode, range, standard deviation, line of best-fit (6 Points)
11. Analysis of Results: Interpretation (8 Points)
12. Possible Experimental Errors including identified human errors (6 Points)
13. Conclusion: Include why your results did or did not support the hypothesis (8 Points)
14. Recommendations for Further Experimentation & Practical Applications (8 Points)

***Scoring:*** Teams will be ranked based on scores out of 120 points. Ties will be broken by comparing the point totals in 1-Variables, 2-Procedure, 3-Analysis of Results, 4- Graph, 5-Data Table (in that order). Students violating proper safety procedures will be asked to leave the room, and their team will be disqualified from the event. Any irrelevant experiments will be ranked below those that are relevant.

***IMPORTANT Final Notes****: Improper clean up will result in loss of 5 points!* Staple your write-up together, with this page as cover sheet. Make sure your team name and number is written on this sheet! *Any late submissions will result in loss of 5 points!*